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(REV 11-2000)

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER

TRANSMITTAL LETTER TO THE UNITED STATES  
DESIGNATED/ELECTED OFFICE (DO/EO/US)  
CONCERNING A FILING UNDER 35 U.S.C. 371

209111US2XPCT

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR

09/856169

INTERNATIONAL APPLICATION NO.

PCT/FR99/03013

INTERNATIONAL FILING DATE

03 December 1999

PRIORITY DATE CLAIMED

04 December 1998

TITLE OF INVENTION

LIQUID CRYSTAL DISPLAY SCREEN WITH REINFORCED STRUCTURE

APPLICANT(S) FOR DO/EO/US

ODILLE Nicolas et al.

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (24) indicated below.
4. ☒ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
  - a. ☐ is attached hereto (required only if not communicated by the International Bureau).
  - b. ☒ has been communicated by the International Bureau.
  - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
  - a. ☒ is attached hereto.
  - b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
  - a. ☐ are attached hereto (required only if not communicated by the International Bureau).
  - b. ☐ have been communicated by the International Bureau.
  - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
  - d. ☒ have not been made and will not be made.
8. ☒ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
10. ☒ An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).
11. ☒ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☒ A copy of the International Search Report (PCT/ISA/210).

Items 13 to 20 below concern document(s) or information included:

13. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☒ A **FIRST** preliminary amendment.
16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
17. ☐ A substitute specification.
18. ☐ A change of power of attorney and/or address letter.
19. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
20. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
1. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
2. ☐ Certificate of Mailing by Express Mail
3. ☒ Other items or information:

Notice for Consideration of Documents Cited in International Search Report  
Notice of Priority/PCT/IB/304/Drawings (2 Sheets)/PCT/IB/308

U.S. APPLICATION NO. (IF KNOWN - SEE 37 CFR 1.53) <div style="font-size: 24pt; font-weight: bold; text-align: center;">09/856169</div>		INTERNATIONAL APPLICATION NO. <div style="font-weight: bold; text-align: center;">PCT/FR99/03013</div>		ATTORNEY'S DOCKET NUMBER <div style="font-weight: bold; text-align: center;">209111US2XPCT</div>	
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24. The following fees are submitted:

**BASIC NATIONAL FEE ( 37 CFR 1.492 (a) (1) - (5)) :**

<input type="checkbox"/> Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO . . . . .	<b>\$1000.00</b>
<input checked="" type="checkbox"/> International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO . . . . .	<b>\$860.00</b>
<input type="checkbox"/> International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO . . . . .	<b>\$710.00</b>
<input type="checkbox"/> International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) . . . . .	<b>\$690.00</b>
<input type="checkbox"/> International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) . . . . .	<b>\$100.00</b>

ENTER APPROPRIATE BASIC FEE AMOUNT =

CALCULATIONS PTO USE ONLY

Surcharge of <b>\$130.00</b> for furnishing the oath or declaration later than months from the earliest claimed priority date (37 CFR 1.492 (e)). <div style="float: right;"> <input type="checkbox"/> 20    <input type="checkbox"/> 30         </div>				<b>\$0.00</b>	
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CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	12 - 20 =	0	x \$18.00		<b>\$0.00</b>
Independent claims	1 - 3 =	0	x \$80.00		<b>\$0.00</b>
Multiple Dependent Claims (check if applicable).				<input type="checkbox"/>	<b>\$0.00</b>
TOTAL OF ABOVE CALCULATIONS =					<b>\$860.00</b>
<input type="checkbox"/> Applicant claims small entity status. (See 37 CFR 1.27). The fees indicated above are reduced by 1/2.					<b>\$0.00</b>
SUBTOTAL =					<b>\$860.00</b>

Processing fee of <b>\$130.00</b> for furnishing the English translation later than months from the earliest claimed priority date (37 CFR 1.492 (f)). <div style="float: right;"> <input type="checkbox"/> 20    <input type="checkbox"/> 30         </div>				<b>\$0.00</b>	
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TOTAL NATIONAL FEE =					<b>\$860.00</b>
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Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable). <div style="float: right;"> <input type="checkbox"/> </div>				<b>\$0.00</b>	
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TOTAL FEES ENCLOSED =					<b>\$860.00</b>
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					Amount to be:	\$
					refunded	
					charged	\$

a. ☒ A check in the amount of **\$860.00** to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. \_\_\_\_\_ in the amount of \_\_\_\_\_ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. **15-0030** A duplicate copy of this sheet is enclosed.

d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

**NOTE:** Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

22850

Surinder Sachar

Registration No. 34,423

SIGNATURE

Marvin J. Spivak

NAME

24,913

REGISTRATION NUMBER

June 4 2001  
 DATE

09/856169

JG08 Rec'd PCT/PTO 04 JUN 2007

209111US

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF: :

NICOLAS ODILLE ET AL. :

SERIAL NO: NEW U.S. PCT APPLN. : ATTN: APPLICATION BRANCH  
(Based on PCT/FR99/03013)

FILED: HEREWITH :

FOR: LIQUID CRYSTAL DISPLAY  
SCREEN WITH REINFORCED  
STRUCTURE

PRELIMINARY AMENDMENT

ASSISTANT COMMISSIONER FOR PATENTS  
WASHINGTON, D.C. 20231

SIR:

Prior to a first examination on the merits, please amend the above-identified  
application as follows:

IN THE CLAIMS

Please cancel Claims 1-12 without prejudice.

Please add new Claims 13-24 as follows:

13. (New) Liquid crystal display screen, comprising a first and a second transparent plate, joined together and between which is contained liquid crystal, the first plate being mechanically reinforced by an at least partially transparent third plate, wherein the first and the third plates are secured together by way of an adhesive element comprising at least one double-sided adhesive film.

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14. (New) Display screen according to Claim 13, wherein the adhesive element comprises at least one sandwich-type assembly made of two double-sided adhesive films separated by a layer of a different material.

15. (New) Display screen according to Claim 14, wherein the two double-sided adhesive films have identical thicknesses.

16. (New) Display screen according to Claim 14, wherein the two double-sided adhesive films have different thicknesses.

17. (New) Display screen according to Claim 14, wherein the layer is made of a material having a firmer structure than that exhibited by the double-sided adhesive films.

18. (New) Display screen according to Claim 13, wherein the adhesive element is laid out between the first and the third plates around an image zone.

19. (New) Display screen according to Claim 18, wherein the layer of different material is made of glass fiber.

20. (New) Display screen according to Claim 18, wherein the layer of different material is opaque to light.

21. (New) Display screen according to Claim 13, wherein the adhesive element is laid out between the first and the third plates over appreciably an entire available surface area.

22. (New) Display screen according to Claim 21, wherein the layer of different material is transparent to light.

23. (New) Display screen according to Claim 13, wherein the at least one double sided adhesive film is of the type formed solely by a mass of adhesive substance.

24. (New) Display screen according to Claim 13, wherein the at least one double sided adhesive film comprises a supporting film, each face of which is coated with an adhesive substance.

#### IN THE ABSTRACT

Please delete the Abstract on page 15 and insert therefor the following new Abstract:

#### ABSTRACT

Liquid crystal image display screens, and particularly to those of the type in which a first transparent plate is stiffened with the aid of a reinforcing plate. The first plate and the reinforcing plate are secured together by an adhesive element including at least one double-sided adhesive film, which can be deposited at the periphery around an image zone. The use of such an adhesive element is simple and avoids having to employ a cumbersome process with uncertain results, as is the case with the use of a cement. The liquid crystal display screens may find particular application in equipping aircraft, helicopters, etc.

#### REMARKS

Favorable consideration of this application, as presently amended, is respectfully requested.

The present preliminary amendment is submitted to place the above-identified application in more proper format under United States practice. By the present preliminary amendment original Claims 1-12 have been cancelled and new Claims 13-24 are presented for examination. New Claims 13-24 are deemed to be self-evident from the original disclosure, including original Claims 1-12, and thus are not deemed to raise any issues of

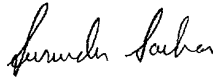
new matter. Any differences between new Claims 13-24 and original Claims 1-12 are believed to at most broaden the scope of new Claims 13-24.

A new Abstract has also been submitted in the present response which is in more proper format under United States practice.

The present application is believed to be in condition for a full and thorough examination on the merits. An early and favorable consideration of the present application is hereby respectfully requested.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,  
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**Marked-Up Copy**

Serial No:

Amendment Filed on:

IN THE CLAIMS

--Claims 1-12 (Cancelled).

Claims 13-24 (New).--

IN THE ABSTRACT

--(New)--.

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## LIQUID CRYSTAL DISPLAY SCREEN WITH REINFORCED STRUCTURE

The present invention relates to liquid crystal image display screens, particularly those mounted in image display devices of the so-called "on-board" type, such as used, for example, in aircraft, helicopters, etc.

Liquid crystal image display screens are now well known, and commonly used. They constitute flat screens used to display monochrome or polychrome images. They are mounted in various display devices which are themselves used in various fields, which often impose manufacturing criteria of their own.

Thus, the liquid crystal screens mounted in display devices of the abovementioned "on-board" type are built according to criteria that are more strict than in the case of apparatus intended for the general public. Their manufacture is designed to meet stringent tests, among others vibration tests, by virtue in particular of a reinforcement of their structure.

Figure 1 diagrammatically represents, as a sectional view, a liquid crystal screen 1, whose structure is reinforced in a conventional manner.

The screen 1 comprises a small thickness of liquid crystal 2 enclosed between a first and a second transparent glass plate 3, 4, called a TFT plate 3 and a backplate electrode 4, respectively. The first plate 3 is generally called a "TFT" (standing for "Thin Film Transistor") because this is what bears the network of transistors (not shown), serving to define liquid crystal cells, and to control them under the effect of voltage signals applied with respect to a backplate electrode (not shown), carried by the second plate 4, which is consequently called a backplate electrode 4.

The TFT plate 3 is larger than the backplate electrode

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4, the latter being the plate oriented on the side of an observer (not shown) who is looking at the screen 1. These two plates 3, 4 are secured together by a bead of cement 5 formed on the periphery of the backplate electrode 4.

The TFT plate and backplate electrode 3, 4 are borne by a mechanical assembly represented by a wall 6, against which solely the TFT plate is pressed by way of seals 8. Consequently, during vibration trials, the backplate electrode 4 determines a disequilibrium or "imbalance" on the TFT plate 3 that is detrimental to the behaviour of the latter. Since, indeed, the backplate electrode 4 is not held mechanically, it tends to amplify deformations and displacements exhibited by the TFT plate.

Any deformation, even if tiny, of the TFT plate entails a variation (a few tenths of micrometres) in the thickness of the liquid crystal contained between the two plates 3, 4, which variation, even if it is tiny, causes a troublesome disturbance in the displayed image: this disturbance is manifested in the image, for example, as the effects of spots and whiteish wavelets.

The solution generally applied to this well-known problem consists in improving the holding of the TFT plate, by stiffening it with the aid of a reinforcing plate 7 of greater or lesser thickness depending on the reinforcement desired. It should be observed that the reinforcing plate 7 is necessarily transparent and must exhibit certain optical qualities, to allow through light (not shown) intended to be modulated by the screen 1 so as to form the image displayed by this screen.

The reinforcing plate 7 is fixed to the TFT plate 3 by cementing with the aid of a layer 9 of a so-called optical cement; it is fixed on the TFT plate 3, on a

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To cope with the various drawbacks and problems raised in the prior art by the fixing of the reinforcing plate to the TFT plate, while retaining the same general structure as that described above with reference to

Figure 1, the invention proposes that the TFT and reinforcing plates be secured by a fixing means other than cement, that is much simpler to use and which therefore does not exhibit the above-explained drawbacks of conventional cementing.

According to the invention, a liquid crystal display screen, comprising a first and a second transparent plate, joined together and between which is contained liquid crystal, the first plate being mechanically reinforced by a transparent third plate, is characterized in that the first and the third plates are secured together by way of an adhesive element comprising at least one double-sided adhesive film.

It is common to use double-sided adhesive films. These films are constructed with the aid of a substance which has the property of adhering strongly to the surfaces onto which it is pressed. They are distributed commercially, for example, by the "3M" company under the name "VHB 3M".

One of the differences between a cement and an adhesive substance such as this is that the latter does not go through any polymerization step, and that, even if it hardens a little over time, it retains much of the flexibility that it had during deployment, unlike cement which tends to harden completely; another advantageous difference as compared with cement is that this adhesive substance exhibits a certain consistency and resistance to crushing.

Double-sided adhesive films are adhesive via each of their two faces, and may therefore be used to join two objects. They are easy to cut, and are available commercially with variable dimensions, ranging, for example, from a few centimetres to several tens of centimetres in width. These adhesive films can be found chiefly in two forms:

5 - In the first form, the double-sided adhesive film comprises a flexible film serving as support, each face of which is coated with the adhesive substance as defined hereinabove. They are generally presented as rolls, the adhesive film being wound around itself with an isolating film, that is to say a film to which the substance hardly adheres at all.

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15 - In its second form, the double-sided adhesive film is made solely from the mass of adhesive substance; for its storage, it cooperates with an "isolating" film to which it therefore adheres very little, and with the aid of which it is wound around itself so as to be stored, here too, in the form of a roll. Two objects may thus be joined together, each adhering to one of the faces of the same layer of adhesive substance.

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Also, the term "double-sided adhesive film" is intended to designate both the case of a double-sided adhesive film made of a supporting film coated with an adhesive substance on each of its faces, and the case of a 25 single layer of adhesive substance with no supporting film, and capable of adhering via each of its faces.

The invention will be better understood and other advantages which it exhibits will become apparent on 30 reading the following description, given by way of non-limiting example, and with reference to the appended figures, among which:

35 - Figure 1, already described, represents, through a sectional view, a liquid crystal display screen structure of the prior art;

- Figure 2 shows diagrammatically, through a sectional view similar to that of Figure 1, a

first embodiment of a liquid crystal display screen structure in accordance with the invention;

5 - Figure 3 shows diagrammatically a liquid crystal display screen structure according to the invention, in a variant of the embodiment shown in Figure 2;

10 - Figure 4 diagrammatically represents a liquid crystal display screen structure in accordance with the invention, according to a second embodiment.

15 Figure 2 diagrammatically represents a liquid crystal display screen 10 in accordance with the invention, through the same sectional view as that showing in Figure 1 the screen of the known art. The general structure of the screen 10 of the invention is the same as that represented in Figure 1, and the only  
20 difference lies in the way in which the TFT and reinforcing plates are secured together.

The screen 1 of the invention therefore comprises a small thickness of liquid crystal 2 enclosed between a  
25 TFT plate 3 and a backplate electrode 4, these latter being bonded to one another by a bead of cement 5.

The TFT plate and backplate electrode 3, 4 are borne by a mechanical assembly represented by a wall 6, against  
30 which the TFT plate is pressed by way of seals 8. A reinforcing plate 7 is secured to the TFT plate 3 so as to stiffen it.

According to a characteristic of the invention, the TFT  
35 plate 3 and the reinforcing plate 7 are fixed to one another with the aid of an adhesive element 11 comprising at least one double-sided adhesive film 12. In the non-limiting example represented in Figure 2, the adhesive element 11 consists of a single double-

sided adhesive film 12. The adhesive element 11 is therefore situated between the two plates 3, 7, in contact with one via one of the adhesive faces and in contact with the other via the other adhesive face.

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The adhesive element 11 has a thickness  $E1$  which, in the example of Figure 2, is given by the thickness  $e1$  of the double-sided adhesive film 12; this thickness  $e1$  of the order of, for example, 0.5 mm, is that of the adhesive film 12 after a crushing which it undergoes when it is pressed between the TFT plate 3 and the reinforcing plate 7, so as to adhere to them forcefully. It should be noted that this crushing tends to reduce (relatively moderately) the thickness of the double-sided adhesive film, in proportions liable to vary as a function of its nature; for example, in the case of a double-sided adhesive film of the "acrylic" type, having a thickness at the start of the order of 0.55 mm, its crushing gives it a thickness  $e1$  of the order of 0.5 mm, namely a thickness reduction of the order of 10%.

According to another characteristic of the invention, the adhesive element 11, that is to say the double-sided adhesive film 12, is positioned towards the periphery of the TFT plate 3 and reinforcing plate 7, in such a way as to be placed around a central zone which corresponds to a zone referred to as the "image zone"  $Zi$ , defined at the interface of the TFT plate 3 and of the backplate electrode 4. The boundaries of the image zone are set slightly back from the outer edges 18 of the backplate electrode 4 (for example by 2 to 3 mm). The image zone  $Zi$  corresponds to the outer boundaries of images which, during operation, are displayed by the screen 1.

The use of double-sided adhesive film, to secure together the reinforcing plate 7 and the TFT plate 3 in

accordance with the invention, allows significant advances:

- on the one hand, it avoids the need, as is the case when using a cement, to employ a process with uncertain results, which is cumbersome to employ and which comprises a large number of tricky steps (which have already been mentioned previously); the time saving afforded by the use of a double-sided adhesive film can be estimated at around 60%, together with better results. Through its flexibility, the double-sided adhesive film also avoids the mechanical stresses prompted by the use of a cement, and avoids the problems of differential thermal expansions which appear over the entire surface in the case of traditional cementing;
- on the other hand, the use of double-sided adhesive film makes it possible to produce a new configuration, which is very difficult or even impossible to obtain with conventional cementing, and which consists in freeing the TFT plate 3 and reinforcing plate 7 of the presence of any cement in the image zone  $Z_i$ ; this has a beneficial consequence in that it avoids impairing the optical qualities of these plates 3, 7 in the particularly sensitive zone, namely the image zone  $Z_i$ .

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As mentioned above, the images are produced from luminous radiation which passes through the TFT and reinforcing plates 3, 7, it is therefore important not to degrade this radiation, otherwise the image will be degraded. With a double-sided adhesive film, it is easy to deposit the latter with a sufficiently precise positioning so that it does not encroach on the image zone, whereas such positioning with a cement is almost

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impossible because, in particular, of the fluidity exhibited by the cement.

5 Trials, in particular vibration trials, have shown  
excellent and even surprising behaviour of the double-  
sided adhesive films used in the configuration  
represented in Figure 2. These trials have been  
performed with a TFT plate 3 with a thickness E2 of  
1.1 mm reinforced by a reinforcing plate 7 with a  
10 thickness of 2 mm with the aid of an adhesive element  
11 made of a single double-sided adhesive film 12 (of  
thickness e1 of 0.5 mm), laid at the periphery (width  
of the adhesive = 5 mm), that is to say around the  
image zone Zi, as in the example of Figure 2: these  
15 trials have shown that a TFT plate such as this behaves  
in vibration just like with a reinforcing plate of  
thickness 1.8 mm cemented over its entire surface to  
the reinforcing plate 7. There is therefore a  
significant benefit for a very small difference in  
20 behaviour, which is easily compensated for if necessary  
by increasing the thickness E2 of the reinforcing  
plate.

It should be noted that it may be useful to perform a  
25 few trials to determine the most appropriate thickness  
e1 of the double-sided adhesive film 12, depending in  
particular on the dimensions and thicknesses of the  
plates 3, 4, 7. This thickness e1 of a double-sided  
adhesive film 12 is significant since it conditions the  
30 efficacy of the reinforcing plate 7: indeed, a double-  
sided adhesive film 12 having a thickness e1 which is,  
for example, too large, may become too flexible, and  
run the risk of behaving like a term which is elastic  
to vibrations; if, conversely, this thickness is too  
35 small, the reinforcing plate 7 may, under vibration,  
create shocks when impacting the TFT plate 3.

It is possible, however, to give the adhesive element  
11 both the desired degree of flexibility and the



thickness E1 corresponding to the spacing sought between the TFT plate 3 and the reinforcing plate 7. To this end, according to the invention, the adhesive element 11 is made with a composite structure.

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Figure 3 represents the adhesive element 11 with composite structure, used in the same configuration as that of Figure 2, that is to say around the image zone Zi. The composite structure of the adhesive element 11 is obtained by associating two double-sided adhesive films 13, 14 with a layer 15 of a different material. Thus, a sandwich-type structure is obtained, with the layer 15 in the central part, trapped between the two double-sided adhesive films 13, 14, of which the outer face of one adheres to the TFT plate 3 and the outer face of the other adheres to the reinforcing plate 7.

By choosing, for the construction of the layer 15, for example a material having a firmer structure than that of the double-sided adhesive films 13, 14, the flexibility of the adhesive element 11 is reduced. The layer 15 constitutes an intermediate substrate which makes it possible to give the adhesive element 11 either a greater thickness E1 or a greater resistance or both of these characteristics. The layer 15 can therefore be formed of a stiffer material than an adhesive film, for example a sheet of plastic, or from glass fibres, or from metal or even from glass, etc. It may, however, be advantageous for the layer 15 to be opaque to light, with a view to reducing any traversal of light through the sides at the level of the junction of the TFT plate 3 and reinforcing plate 7.

In the example shown in Figure 3, the thickness E1 of the adhesive element 11 results from the superposition of the upper double-sided adhesive film 13, of the layer 15 and of the lower double-sided adhesive film 14, having respective thicknesses e1, e2, e3 which are compounded. The double-sided adhesive films 13, 14 may

have different thickness values  $e_1$ ,  $e_3$ , or identical ones as in the non-limiting example represented where their thickness is, for example, 0.25 mm; the layer 15 can be made of glass fibres with a thickness of the order of 0.30; consequently, the thickness  $E_1$  conferred on the adhesive element 11 is of the order of 0.8 mm. Of course, the adhesive element 11 can be formed by the superposition of several sandwiches such as that consisting of the double-sided adhesive films 13, 14 and the layer 15, possibly with different characteristics as to the dimensions and/or nature of the layer 15.

If, for whatever reason, it is desired to stiffen the TFT plate 3 by securing it to the reinforcing plate 7 over a larger surface area, larger than that which results from a peripheral type positioning of the adhesive element 11 as represented in Figures 2 and 3, it is also possible to secure these two plates 3, 7 together via the adhesive element 11 over the entire available surface area; the available surface area is that which corresponds to the facing surfaces of these two plates 3, 7.

Figure 4 represents the TFT plate 3 secured over the entire available surface area to the reinforcing plate 7 by an adhesive element 11. In this case, the adhesive element 11 is formed by a single double-sided adhesive film 16 preferably chosen with good transparency, so as not to affect the optical qualities of the image zone  $Z_i$ .

It should be noted that, in this case also, the thickness  $e_1$  of the double-sided adhesive film 16 is significant, since, if it is too large, it runs the risk, under vibration, of introducing an elastic term and of adversely affecting the efficacy of the reinforcing plate 7. The solution shown in Figure 3 of an adhesive element 11, comprising a sandwich made of

two double-sided films 13, 14 separated by a layer 15  
of a different material, can also be used in this  
version of the invention, on condition that the layer  
15 is made of a transparent material, a plastic film or  
5 glass for example. Of course, this version of the  
invention makes it especially necessary to avoid  
introducing optical defects (bubbles, dust) into the  
image zone Zi.

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**CLAIMS**

1. Liquid crystal display screen, comprising a first and a second transparent plate (3, 4), joined together and between which is contained liquid crystal (2), the first plate (3) being mechanically reinforced by an at least partially transparent third plate (7), characterized in that the first and the third plates (3, 7) are secured together by way of an adhesive element (11) comprising at least one double-sided adhesive film (12, 13, 14, 16).
2. Display screen according to Claim 1, characterized in that the adhesive element (11) comprises at least one sandwich-type assembly made of two double-sided adhesive films (13, 14) separated by a layer (15) of a different material.
3. Display screen according to Claim 2, characterized in that the two double-sided adhesive films (13, 14) have identical thicknesses (e1, e2).
4. Display screen according to Claim 2, characterized in that the two double-sided adhesive films (13, 14) have different thicknesses (e1, e2).
5. Display screen according to any one of Claims 2 or 3 or 4, characterized in that the layer (15) is made of a material having a firmer structure than that exhibited by the double-sided adhesive films (13, 14).
6. Display screen according to one of the preceding claims, characterized in that the adhesive element (11) is laid out between the first and the third plates (3, 7) around a zone called an image zone (Zi).

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**ABSTRACT**

**LIQUID CRYSTAL DISPLAY SCREEN WITH REINFORCED STRUCTURE**

The present invention relates to liquid crystal image display screens, and particularly to those of the type in which a first transparent plate (3) is stiffened with the aid of a so-called reinforcing plate (7).

In accordance with the invention, the first plate (3) and the reinforcing plate (7) are secured together by way of an adhesive element (11) comprising at least one double-sided adhesive film (12, 13, 14, 16), which can be deposited at the periphery around the image zone.

The use of such an adhesive element (11) is simple and it avoids having to employ a cumbersome process with uncertain results, as is the case in the prior art with the use of a cement.

The invention applies in particular to liquid crystal display screens intended to equip aircraft, helicopters, etc.

Figure 2.

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FIG.3

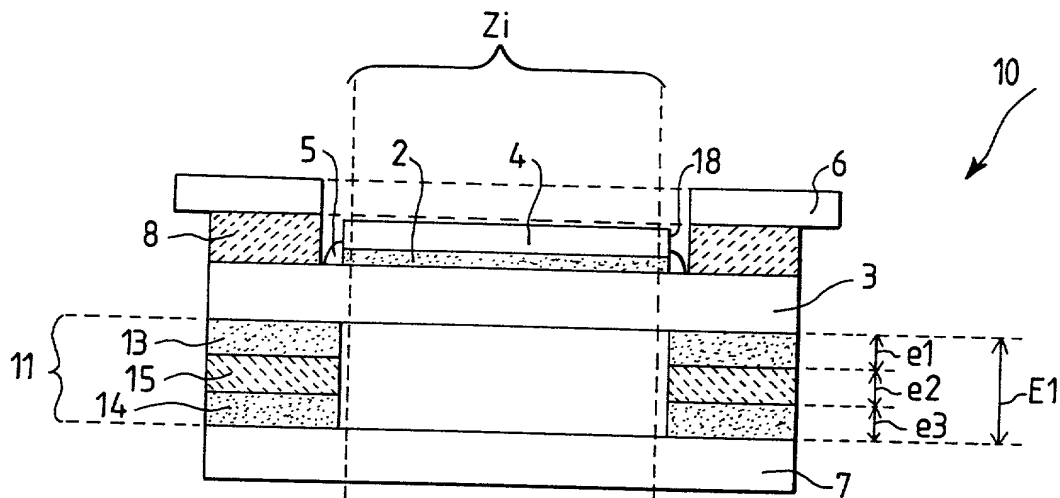
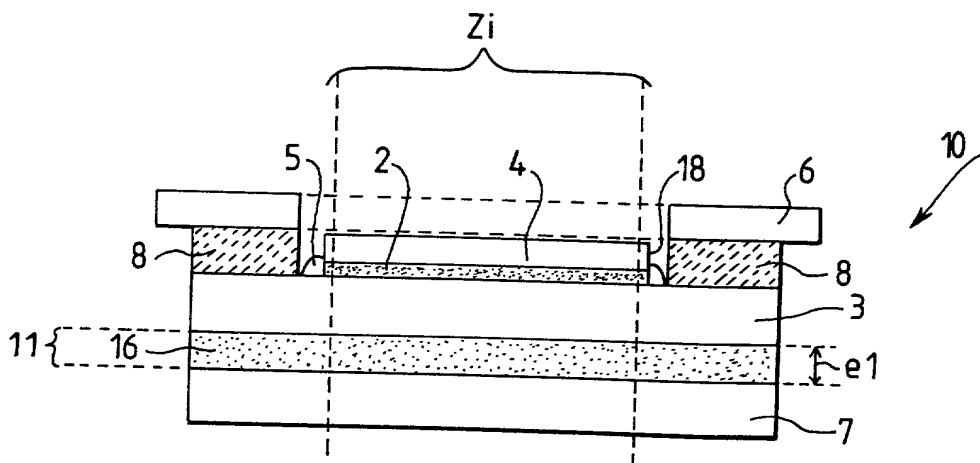


FIG.4





# Declaration and Power of Attorney for Patent Application

## Déclaration et Pouvoirs pour Demande de Brevet

### French Language Declaration

En tant l'inventeur nommé ci-après, je déclare par le présent acte que

As a below named inventor, I hereby declare that:

Mon domicile, mon adresse postale et ma nationalité sont ceux figurant ci-dessous à côté de mon nom

My residence, post office address and citizenship are as stated next to my name

Je crois être le premier inventeur original et unique (si un seul nom est mentionné ci-dessous), ou l'un des premiers co-inventeurs originaux (si plusieurs noms sont mentionnés ci-dessous) de l'objet revendiqué, pour lequel une demande de brevet a été déposée concernant l'invention intitulée

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

et dont la description est fournie ci-joint à moins

the specification of which:

☐ ci-joint

☐ is attached hereto.

☐ a été déposée le \_\_\_\_\_

☒ was filed on 3 DECEMBER 1999

sous le numéro de demande des Etats-Unis ou le numéro de demande international PCT

as United States Application Number or PCT International Application Number

\_\_\_\_\_ et modifiée le

PCT/FR99/03013 \_\_\_\_\_ and was amended on

\_\_\_\_\_ (le cas échéant).

\_\_\_\_\_ (if applicable).

Je déclare par le présent acte avoir passé en revue et compris le contenu de la description ci-dessus, revendications comprises, telles que modifiées par toute modification dont il aura été fait référence ci-dessus.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

Je reconnais devoir divulguer toute information pertinente à la brevetabilité, comme défini dans le Titre 37, § 1.56 du Code fédéral des réglementations.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56.

## French Language Declaration

Je revendique par le présent acte avoir la priorité étrangère, en vertu du Titre 35, § 119(a)-(d) ou § 365(b) du Code des Etats-Unis, sur toute demande étrangère de brevet ou certificat d'inventeur ou, en vertu du Titre 35, § 365(a) du même Code, sur toute demande internationale PCT désignant au moins un pays autre que les Etats-Unis et figurant ci-dessous et, en cochant la case, j'ai aussi indiqué ci-dessous toute demande étrangère de brevet, tout certificat d'inventeur ou toute demande internationale PCT ayant une date de dépôt précédant celle de la demande à propos de laquelle une priorité est revendiquée

I hereby claim foreign priority under Title 35, United States Code, § 119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT International application which designated at least one country other than the United States, listed below, and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed

Prior Foreign Application(s)  
Demande(s) de brevet antérieure(s) dans un autre pays

Priority claimed  
Droit de priorité  
revendiqué

98 15358

FRANCE

4 DECEMBER 1998

(Number)  
(Numéro)

(Country)  
(Pays)

(Day/Month/Year Filed)  
(Jour/Mois/Année de dépôt)

☒  
Yes  
Oui

☐  
No  
Non

(Number)  
(Numéro)

(Country)  
(Pays)

(Day/Month/Year Filed)  
(Jour/Mois/Année de dépôt)

☐  
Yes  
Oui

☐  
No  
Non

Je revendique par le présent acte tout bénéfice, en vertu du Titre 35, § 119(e) du Code des Etats-Unis, de toute demande de brevet provisoire effectuée aux Etats-Unis et figurant ci-dessous.

I hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional application(s) listed below

(Application No.)  
(N° de demande)

(Filing Date)  
(Date de dépôt)

(Application No.)  
(N° de demande)

(Filing Date)  
(Date de dépôt)

Je revendique par le présent acte tout bénéfice, en vertu du Titre 35, § 120 du Code des Etats-Unis, de toute demande de brevet effectuée aux Etats-Unis, ou en vertu du Titre 35, § 365(c) du même Code, de toute demande internationale PCT désignant les Etats-Unis et figurant ci-dessous et, dans la mesure où l'objet de chacune des revendications de cette demande de brevet n'est pas divulgué dans la demande antérieure américaine ou internationale PCT, en vertu des dispositions du premier paragraphe du Titre 35, § 112 du Code des Etats-Unis, je reconnais devoir divulguer toute information pertinente à la brevetabilité, comme défini dans le Titre 37, § 1.56 du Code fédéral des réglementations, dont j'ai pu disposer entre la date de dépôt de la demande antérieure et la date de dépôt de la demande nationale ou internationale PCT de la présente demande:

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s), or § 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application.

PT/FR99/03013

3 DECEMBER 1999

(Application No.)  
(N° de demande)

(Filing Date)  
(Date de dépôt)

(Status) (patented, pending, abandoned)  
(Statut) (breveté, en cours d'examen, abandonné)

(Application No.)  
(N° de demande)

(Filing Date)  
(Date de dépôt)

(Status) (patented, pending, abandoned)  
(Statut) (breveté, en cours d'examen, abandonné)

Je déclare par le présent acte que toute déclaration ci-incluse est, à ma connaissance, véridique et que toute déclaration formulée à partir de renseignements ou de suppositions est tenue pour véridique, et de plus, que toutes ces déclarations ont été formulées en sachant que toute fausse déclaration volontaire ou son équivalent est passible d'une amende ou d'une incarcération, ou des deux, en vertu de la Section 1001 du Titre 18 du Code des Etats-Unis, et que de telles déclarations volontairement fausses risquent de compromettre la validité de la demande de brevet ou du brevet délivré à partir de celle-ci.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

## French Language Declaration

**POUVOIRS:** En tant que l'inventeur cité, je désigne par la présente l'(les) avocat(s) et/ou agent(s) suivant(s) pour qu'ils poursuive(nt) la procédure de cette demande de brevet et traite(nt) toute affaire s'y rapportant avec l'Office des brevets et des marques: (*mentionner le nom et le numéro d'enregistrement*).

**POWER OF ATTORNEY:** As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: (*list name and registration number*)

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Direct Telephone calls to: (*name and telephone number*)

(703) 413-3000

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Signature de l'inventeur	Date	Second inventor's signature <b>Xavier BIBES</b>	Date May 14, 2001
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(Fournier les mêmes renseignements et la signature de tout co-inventeur supplémentaire.)

(Supply similar information and signature for third and subsequent joint inventors.)

## French Language Declaration

Nom complet du troisième co-inventeur, le cas échéant		Full name of third joint inventor, if any <u>Philippe MATEOS</u>	
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	33750 CAMARSAC <u>PKX</u> FRANCE		

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Signature de l'inventeur	Date	Fourth Inventor's signature <u>Christophe Venencie</u>	Date May 14, 2001
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Nom complet du cinquième co-inventeur, le cas échéant		Full name of fifth joint inventor, if any	
Signature de l'inventeur	Date	Fifth Inventor's signature	Date
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Nationalité	Citizenship		
Adresse Postale	Post Office Address		

Nom complet du sixième co-inventeur, le cas échéant		Full name of sixth joint inventor, if any	
Signature de l'inventeur	Date	Sixth Inventor's signature	Date
Domicile	Residence		
Nationalité	Citizenship		
Adresse Postale	Post Office Address		

(Fournir les mêmes renseignements et la signature de tout co-inventeur supplémentaire.)

(Supply similar information and signature for third and subsequent joint inventors.)